BASIC PLC
Programmable Logic Controller

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2025 / 2026

PLC Course

01

Introduction

Numbering System, Logic Gate, Flip Flop, Register, Decoder, Tri-State Buffer, Latch, I/O Port , Memory, Microprocessor, Microcontroller/DSP, PLC/DDC

02

PLC H/W

What and Why?, PLC Construction, Memory, I/O modules, Special Modules, PLC Type

03

PLC S/W

PLC Programming
Ladder
Instruction list
Function chart

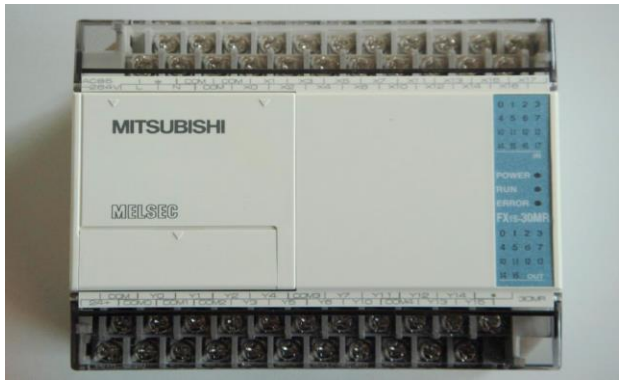
04

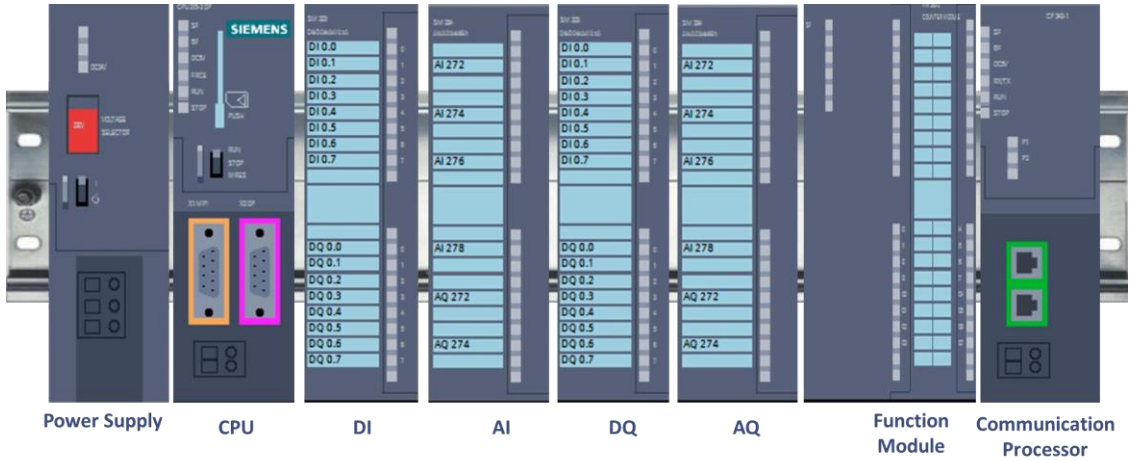
Control Problem

classification and Examples on
1-Interlock Control Problems
2-Sequential Control Problems 3-Random Control Problem

PLC Type

PLC Types	Small	Medium	Large
No. of I/O	64 / 64	128 / 128	>128/>128
Memory Size	Up to 10 k step	Up to 38 K step	>38 K Step
Unit Modules	Only one Board	Modular	Modular





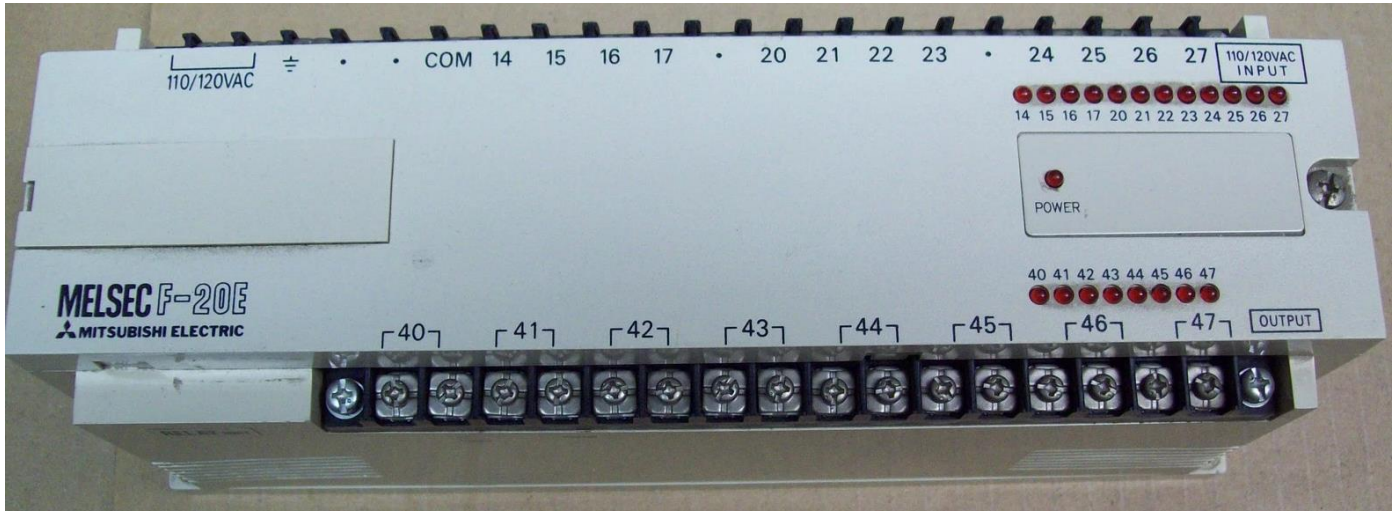
Examples on Small Type PLC

Mitsubishi		Hitachi	
F12	6 I/P, 6 O/P	***H20***	12 I/P, 8 O/P
F20	12 I/P, 8 O/P	***H28***	16 I/P, 12 O/P
F30	16 I/P, 14 O/P	***H40***	24 I/P, 16 O/P
F40	24 I/P, 16 O/P	***H64***	40 I/P, 24 O/P
F60	36 I/P, 24 O/P		

Mitsubishi F20

The locations Numbering in Octal Numbering System as following

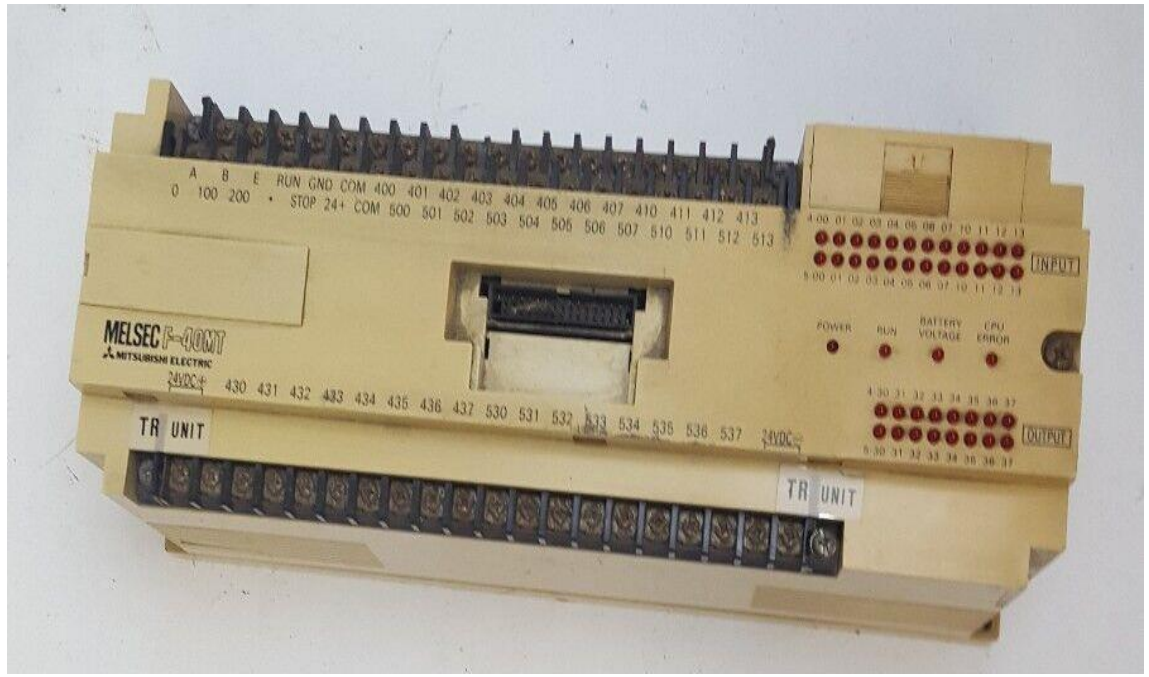
12 I/P	X400-X407
	X410-X413
8 O/P	Y430-Y437
8 Timer	T450-T457
8 Counter	C460-C467
64 Auxiliary Relay	M100-M107
	.....
	M170-M177



F40 Mitsubishi

The locations Numbering in Octal Numbering System as following

24 I/P	X400-X407
	X410-X413
	X500-X507
	X510-X513
16 O/P	Y430-Y437
	Y530-Y537
16 Timer	T450-T457
	T550-T557
16 Counter	C460-C467
	C560-C567
128 Auxiliary Relay	
	64 backed battery
	M100-M107
	.....
	M170-M177
	.....
	M370-M377
Special Function Markers	
	M70, M71, M72, M75, M77



H20 Hitachi

12 I/P	X00000-X000011
8 O/P	Y00100-Y00107
Timer (all of 255)	
on Delay	TD0-TD255
Single Shoot	SS0 – SS255
Counter (all timers and Counters are 512)	
UP Counter	CU0 - CU 511
UP/DOWN Counter	
UP Coil	CTU0 – CTU 511
DOWN Coil	CTD0 – CTD511
Its Contactor	CT0 - CT511
Rising Detection Edge	DIF0-DIF127
Falling Detection Edge	DFN0-DFN127
Auxiliary Relay and Words	
Bit/Word Shard	M0-MFFF
	WM0-WMFF.
Bit/Word independent	R0- R7BF
	WR0- WR3FF
CPU Link Area	L0-L7F
	WL0-WL7
	L10000-L1007F
	WL10000-WL1007
Special Markers	R7C0- R7FF
	WRF000- WRF1FF

H250 Hitachi

I/P	X0uabb
O/P	Y0uabb
Timer	
on Delay	TD0-TD255
Single Shoot	SS0 – SS255
Watchdog	WDT0-WDT255
Monostable	MS0-MS255
Accumulation	TMR0-TMR255
8 Counter	
UP Counter	CU0 - CU 511
UP/DOWN Counter	
UP Coil	CTU0 – CTU 511
DOWN Coil	CTD0 – CTD511
Its Contactor	CT0 - CT511
Ring Counter	RCU0 – RCU511
Rising Detection Edge	DIF0-DIF511
Falling Detection Edge	DFN0-DFN511
Auxiliary Relay and Words	
Bit/Word Shard	M0 - M3FFF
	WM0-WM3FF.
Bit/Word independent	R000- R7BF
	WR0000- WR43FF
CPU Link Area	L0-L3FFF
	WL0-WL3FF
	DWL0-DWL3FE
	L10000-L13FFF
	WL10000-WL13FF
	DWL0-DWL3FE
Special Markers	R7C0- R7FF
	WRF000- WRF1FF

03

PLC S/W

PLC Programming languages

Ladder

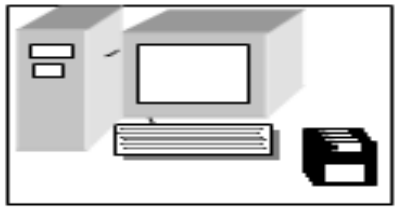
Instruction list

Function chart

PLC Programming

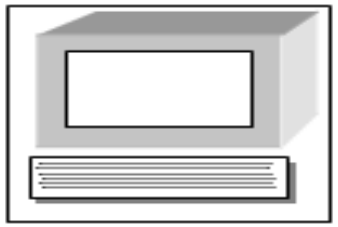
Programming Devices

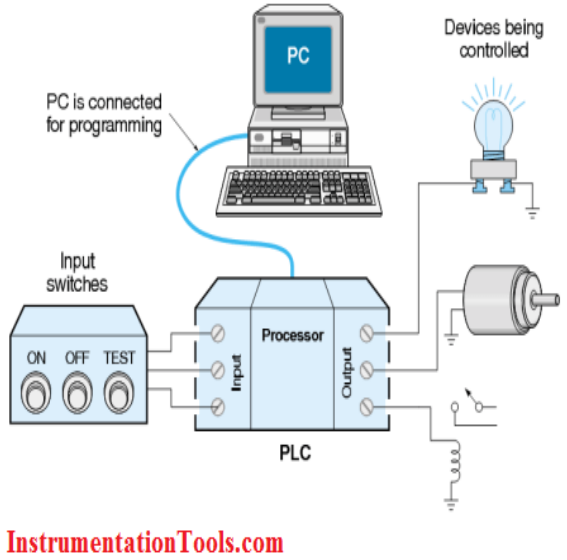
PC+ software

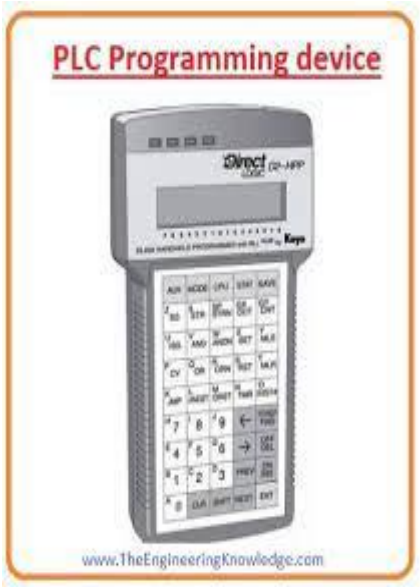


Hand Held

PLC Terminal

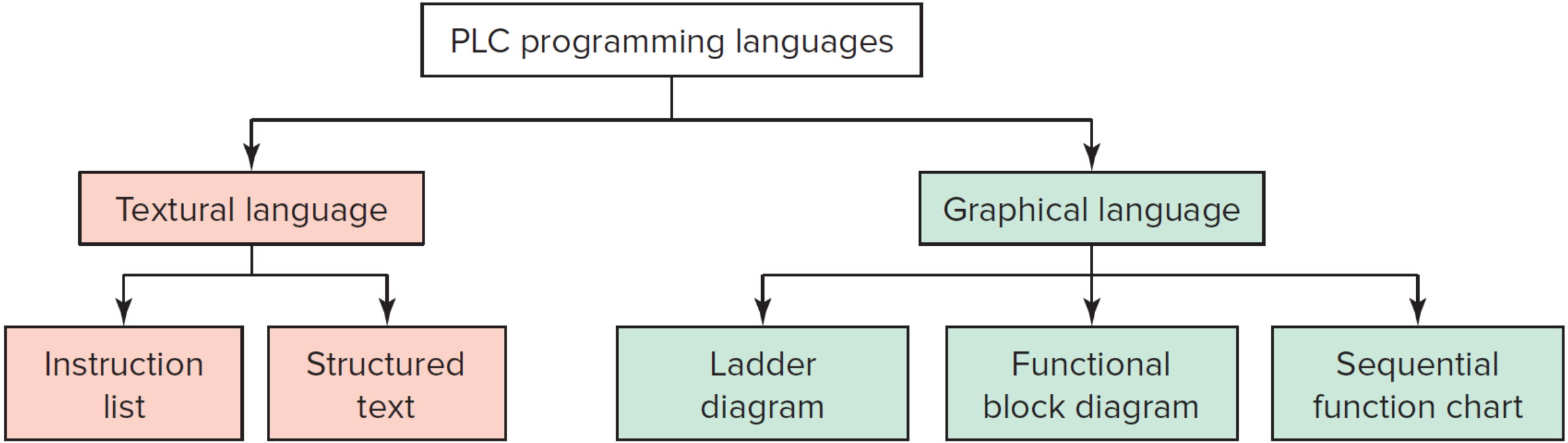






PLC Programming languages

- The term PLC programming language refers to the method by which the user communicates information to the PLC.
- The standard IEC 61131 was established to standardize the multiple languages associated with PLC programming by defining the following five standard languages:

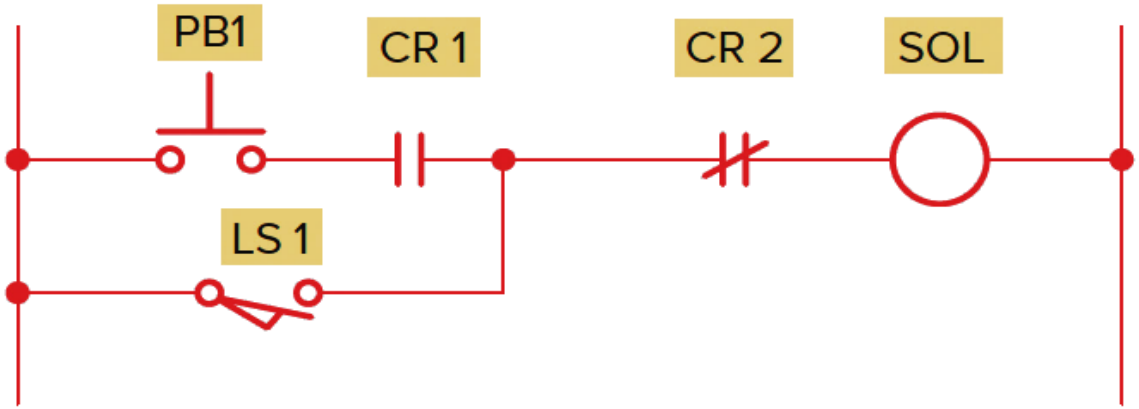


PLC Programming languages

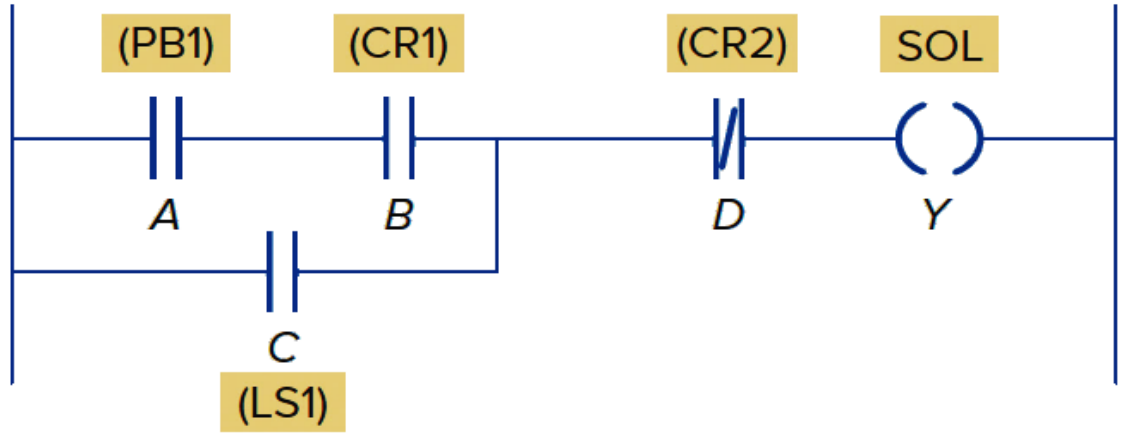
1) Ladder diagram language

is the most commonly used PLC language and is designed to mimic relay logic.

• The ladder diagram is popular for those who prefer to define control actions in terms of relay contacts and coils, and other functions as block instructions.



(*a*) Hardwired relay control circuit

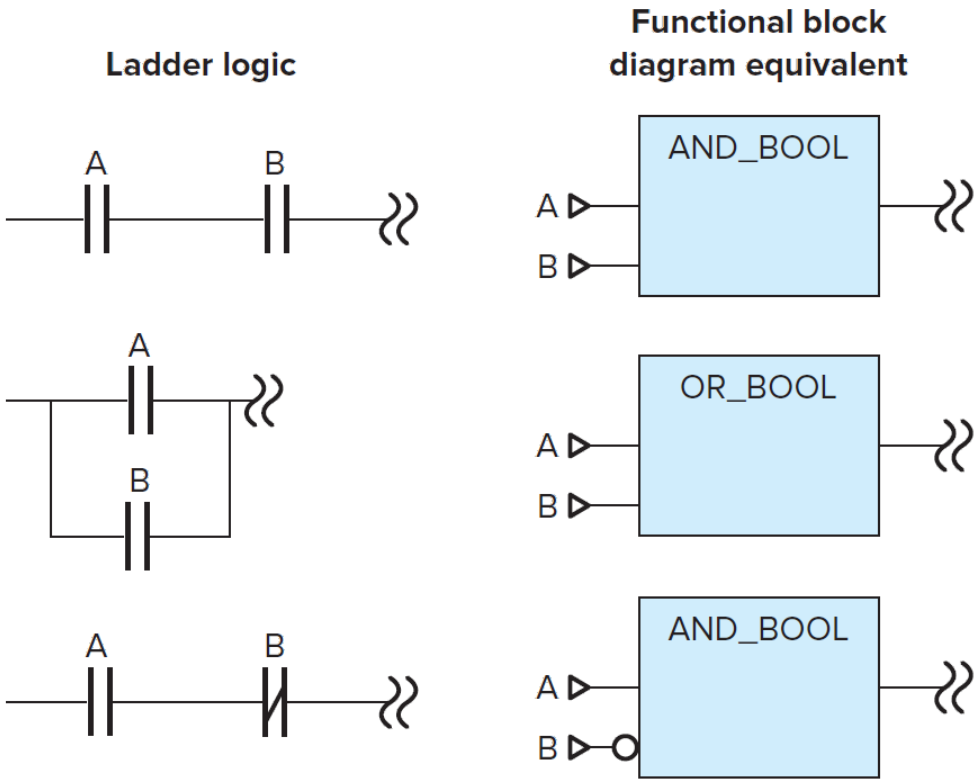


(*b*) Equivalent ladder diagram (LD) program

PLC Programming languages

2) Function Block Diagram (FBD):

a graphical depiction of process flow using simple and complex interconnecting blocks. The use of function blocks for programming of programmable logic controllers (PLCs) is gaining wider acceptance.

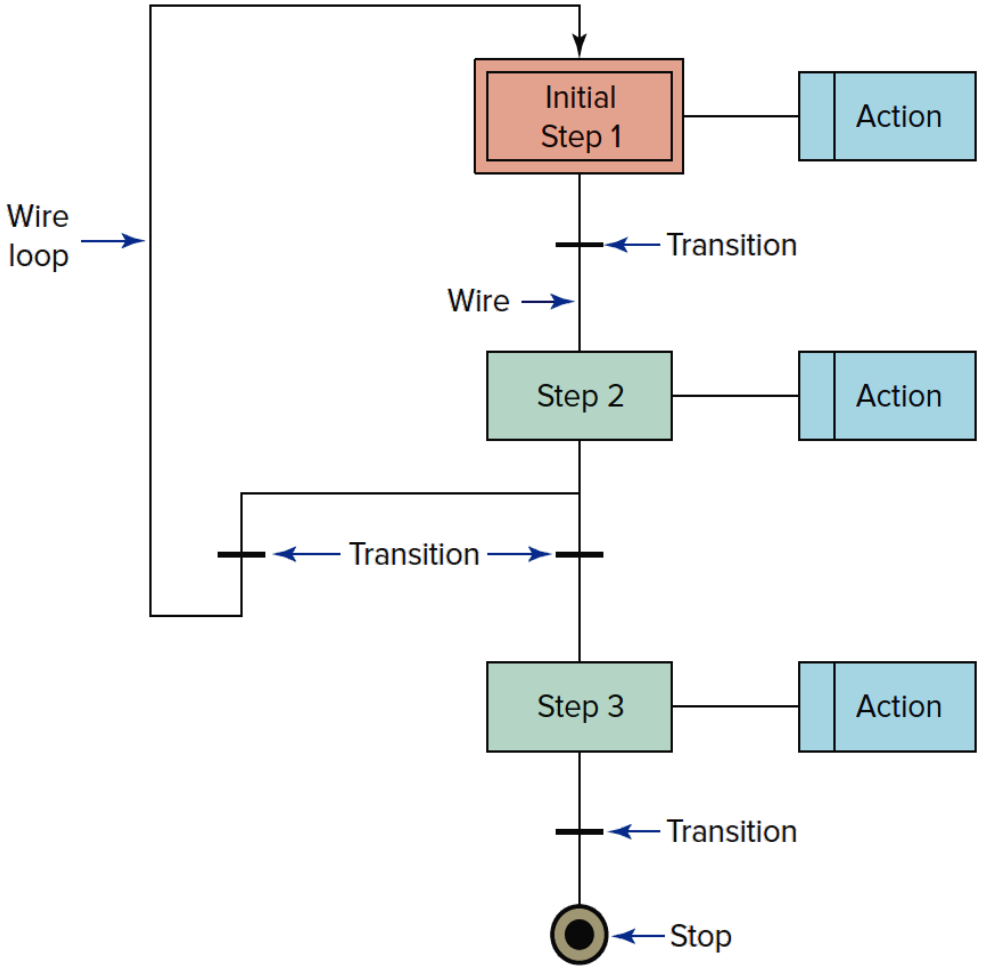


PLC Programming languages

3) Sequential Function Chart (SFC):
graphical depiction of interconnecting steps, actions, and transitions.

- SFC programming is designed to accommodate the programming of more advanced processes.

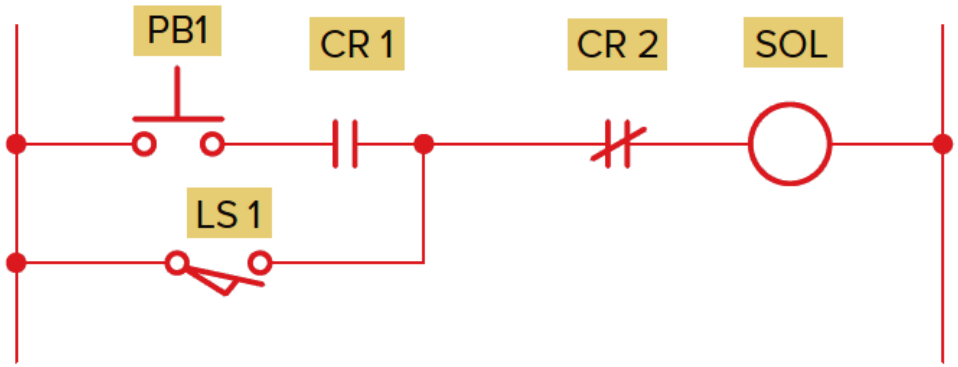
- This type of program can be split into steps with multiple operations happening in parallel branches.



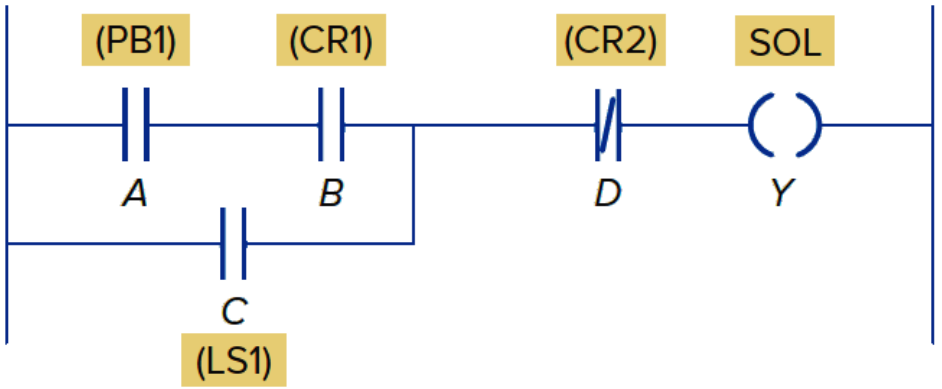
PLC Programming languages

4) Instruction List (IL):

a low-level, text-based language that uses mnemonic instructions. The instructional list consists of a series of instructions that refer to the basic AND, OR, and NOT logic gate functions.



(*a*) Hardwired relay control circuit



(*b*) Equivalent ladder diagram (LD) program

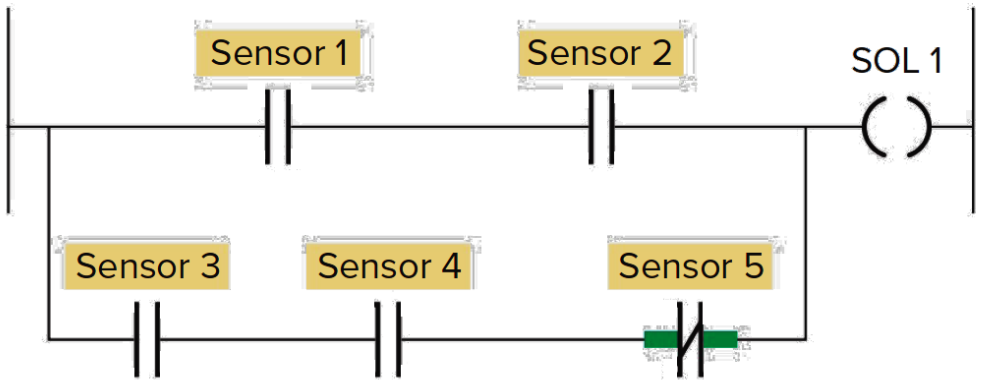
START	PB 1
AND	CR 1
OR	LS1
AND NOT	CR 2
OUT	SOL

(*c*) Equivalent instruction list (IL) program

PLC Programming languages

5) Structured Text (ST):

a high-level, text-based language such as BASIC, C, C++ OR C# specifically developed for industrial control applications. Structured text uses statements to define what to execute.

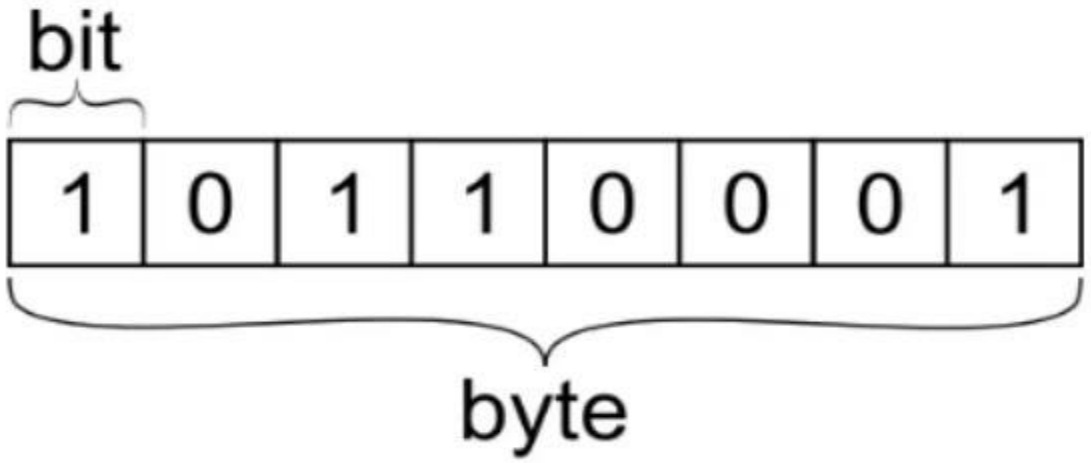


Ladder diagram (LD) program

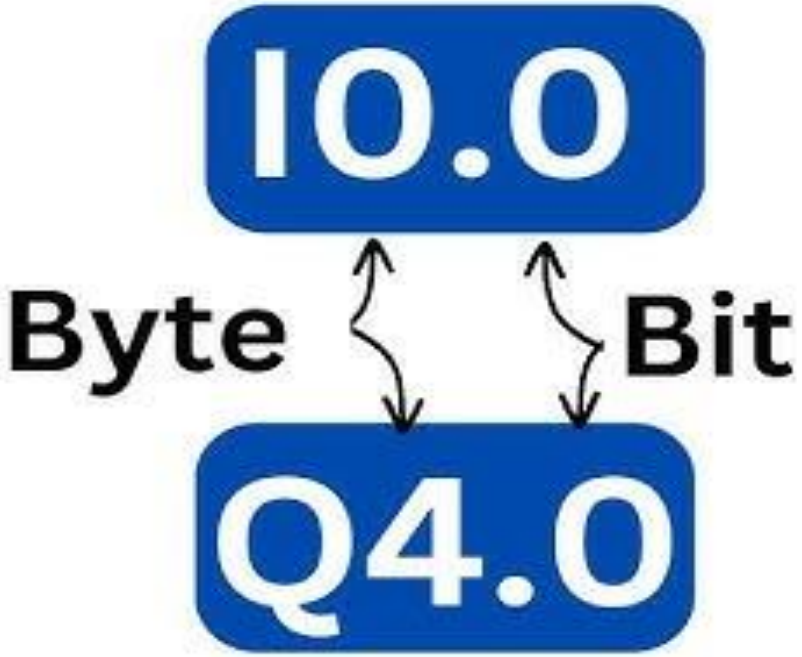
```
IF Sensor_1 AND Sensor_2 THEN
        SOL_1 := 1;
ELSEIF Sensor_3 AND Sensor_4 AND NOT Sensor_5 THEN
        SOL_1 := 1;
END_IF;
```

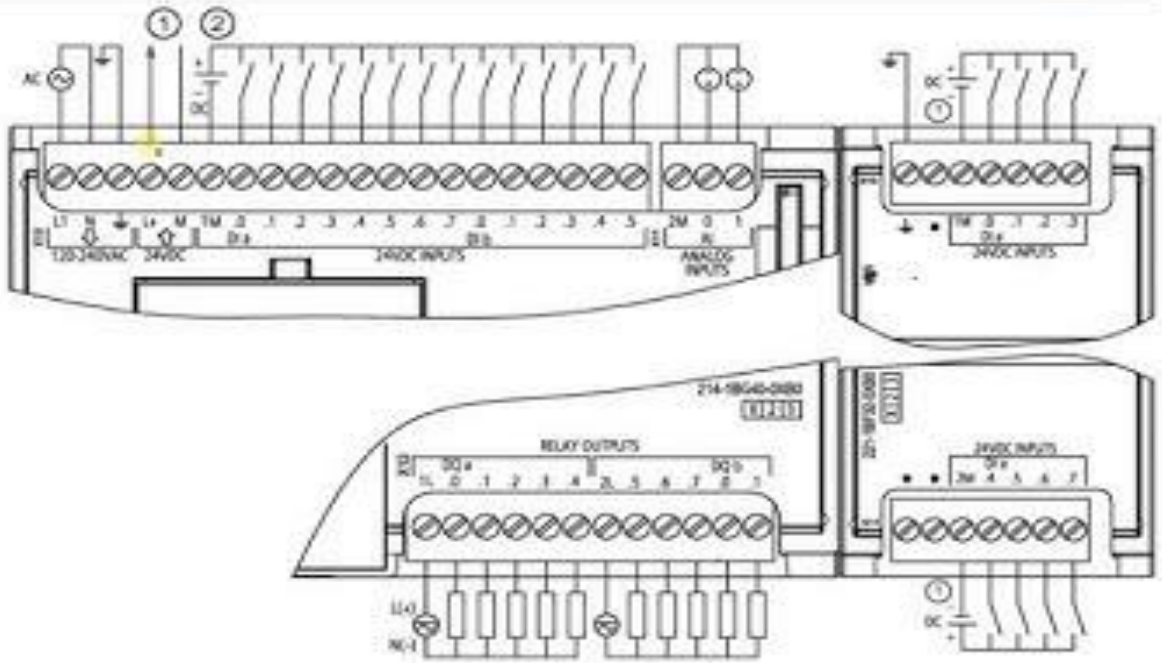
PLC Ladder Logic Programming

PLC Data Types



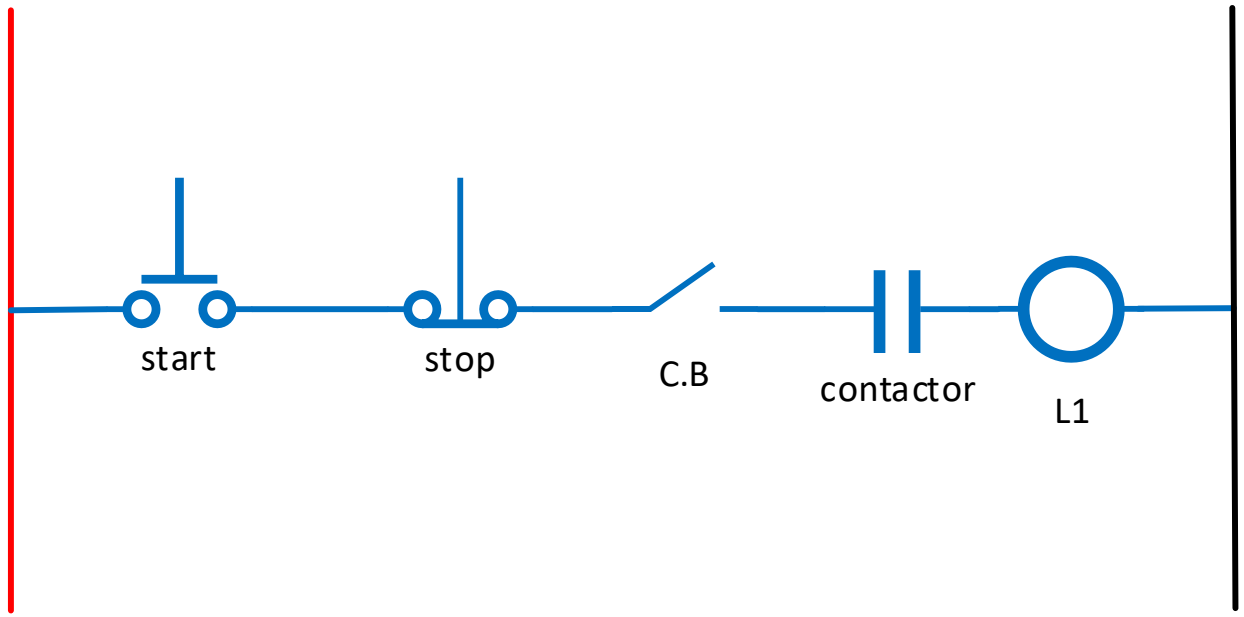
PLC Digital Input output addressing



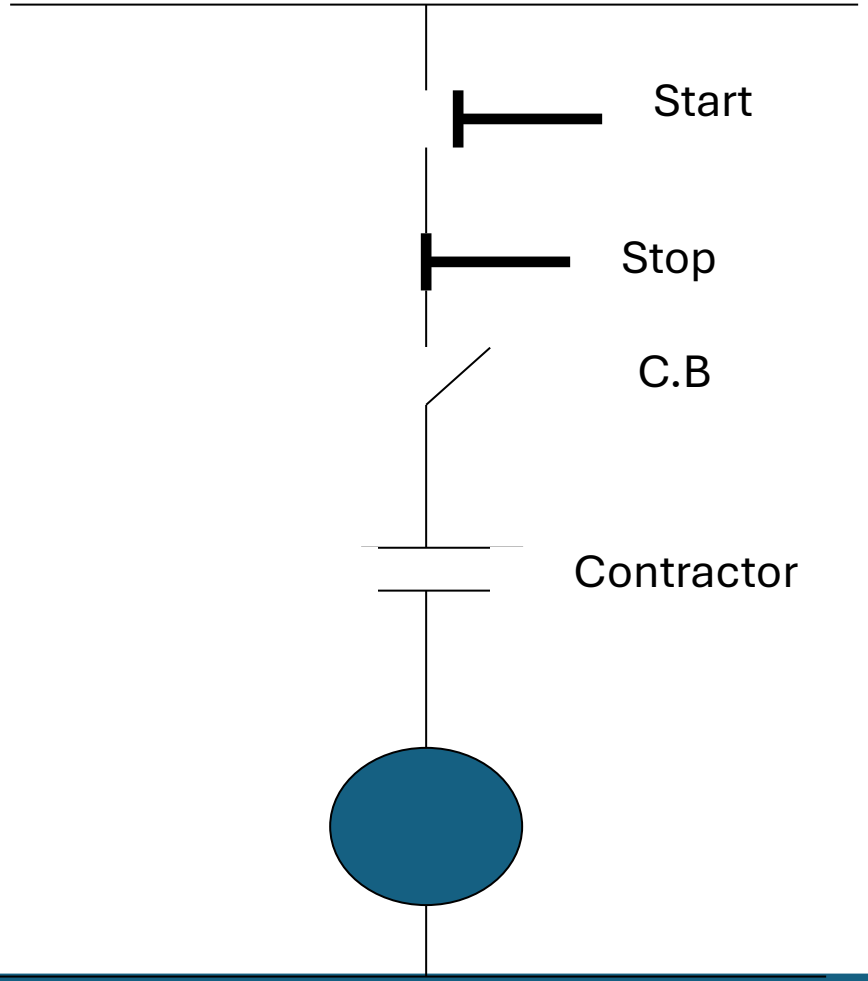


What and Why Ladder

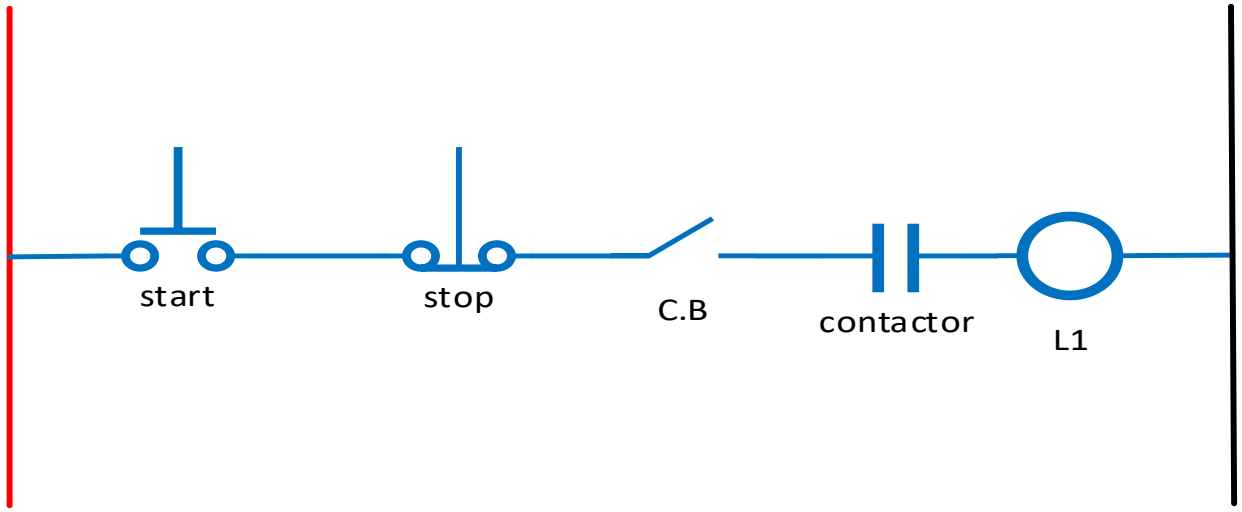
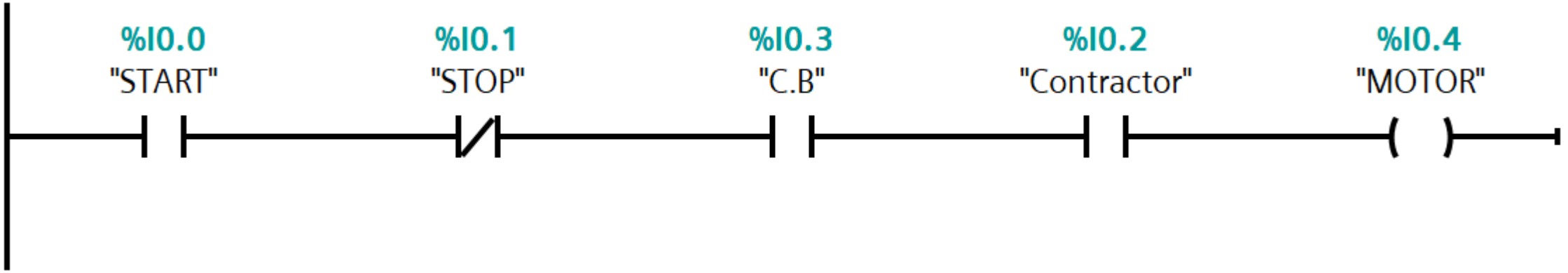
Ladder logic is a programming language that creates and represents a program through ladder diagrams that are based on circuit diagrams.



Single Line Diagram



What and Why Ladder



A ring circuit is an electrical system in which distribution points are connected to the main supply in a continuous closed circuit